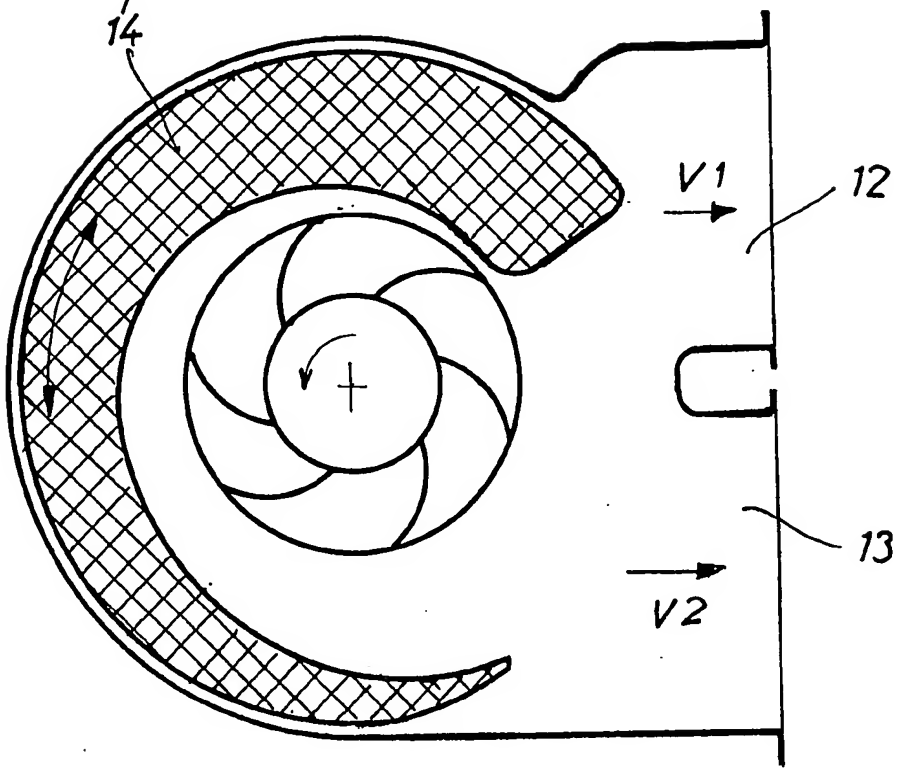


Fig. 2

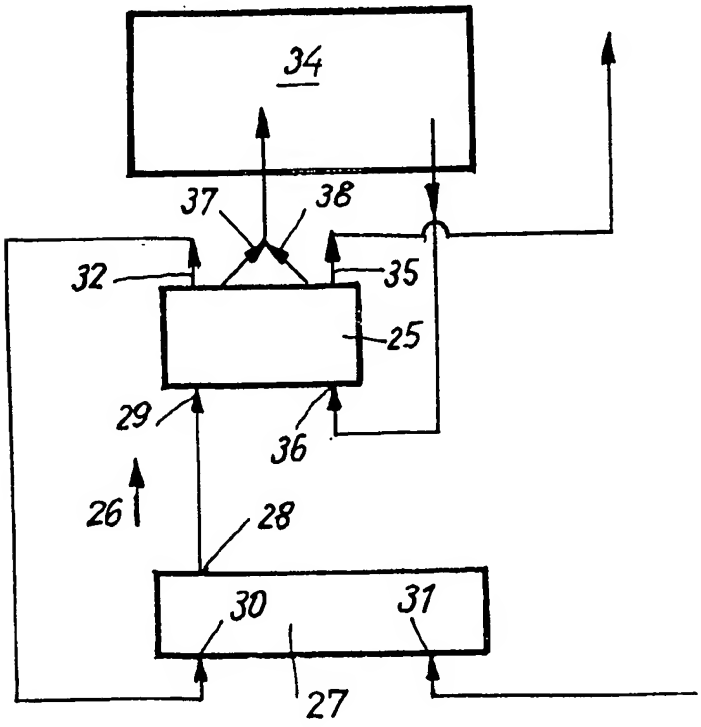


Fig. 5

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# (54) Blowers for air conditioning plant

(57) The blower has an outer housing (1) with an intake port (2) for connection with an intake duct, and at least two outlet ports (3 and 4) for connection with outlet ducts. The flow of air from the impeller (5) to the two or more outlet ports is controlled by an adjustable wall so that the distribution of the flow between the two ports is changed. The adjustable wall is in the form of an inner wall (6) placed between the impeller and the outer housing and having an outline conforming with that of the outer housing. The adjustable inner wall may be moved into a number of different settings corresponding to the number of outlet ports, in each of which one of the outlet ports is uncovered and the other outlet port or ports are shut off from the impeller by the inner wall. Furthermore the inner wall may be moved into any number of positions between the settings. The wall (6) may be filled with acoustically absorbing material or made of foam plastics.

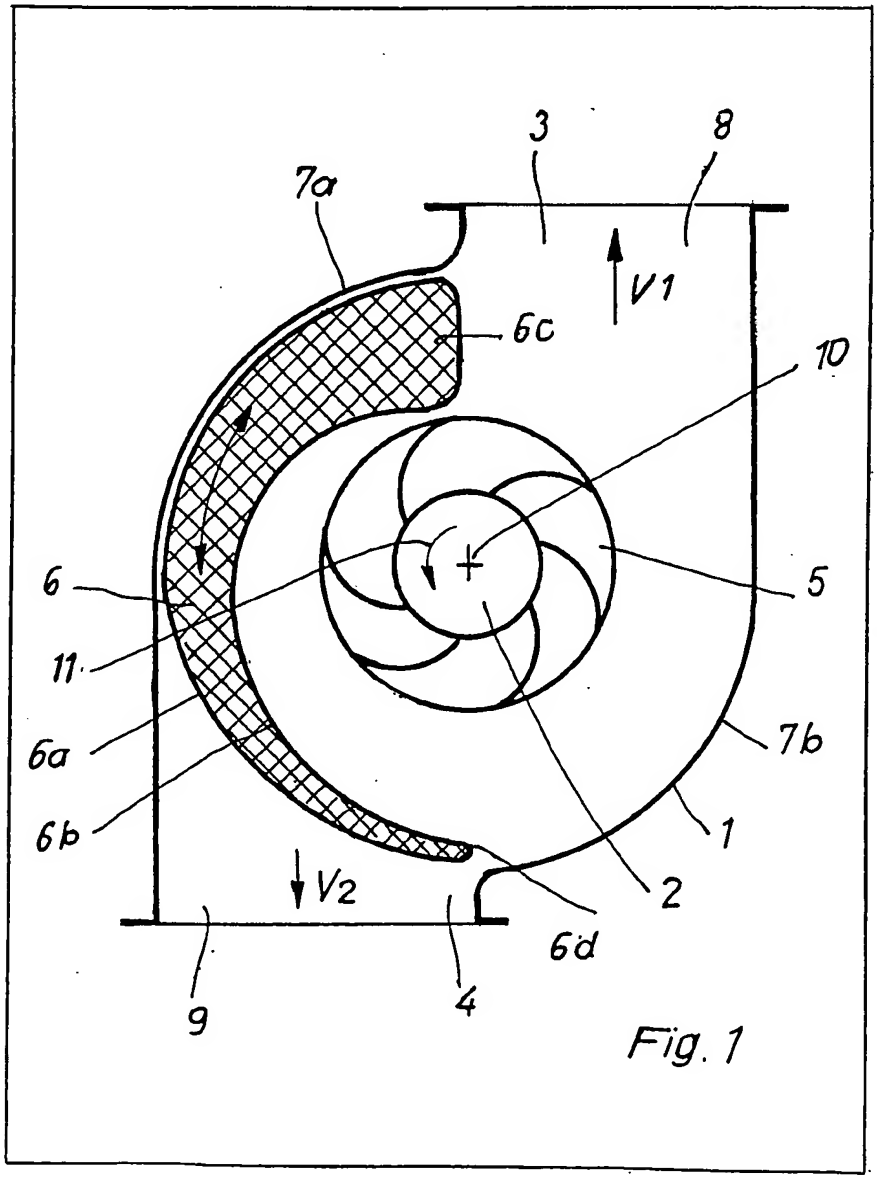


Fig. 1

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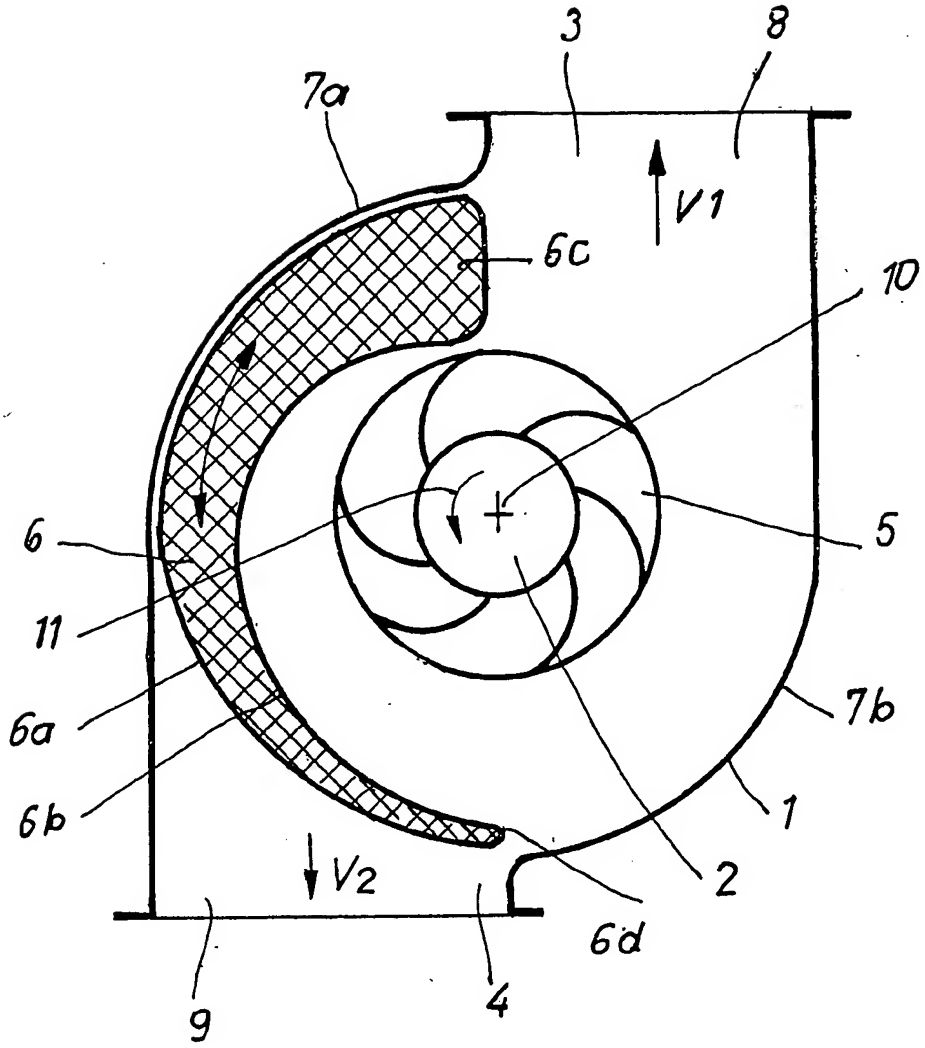


Fig. 1

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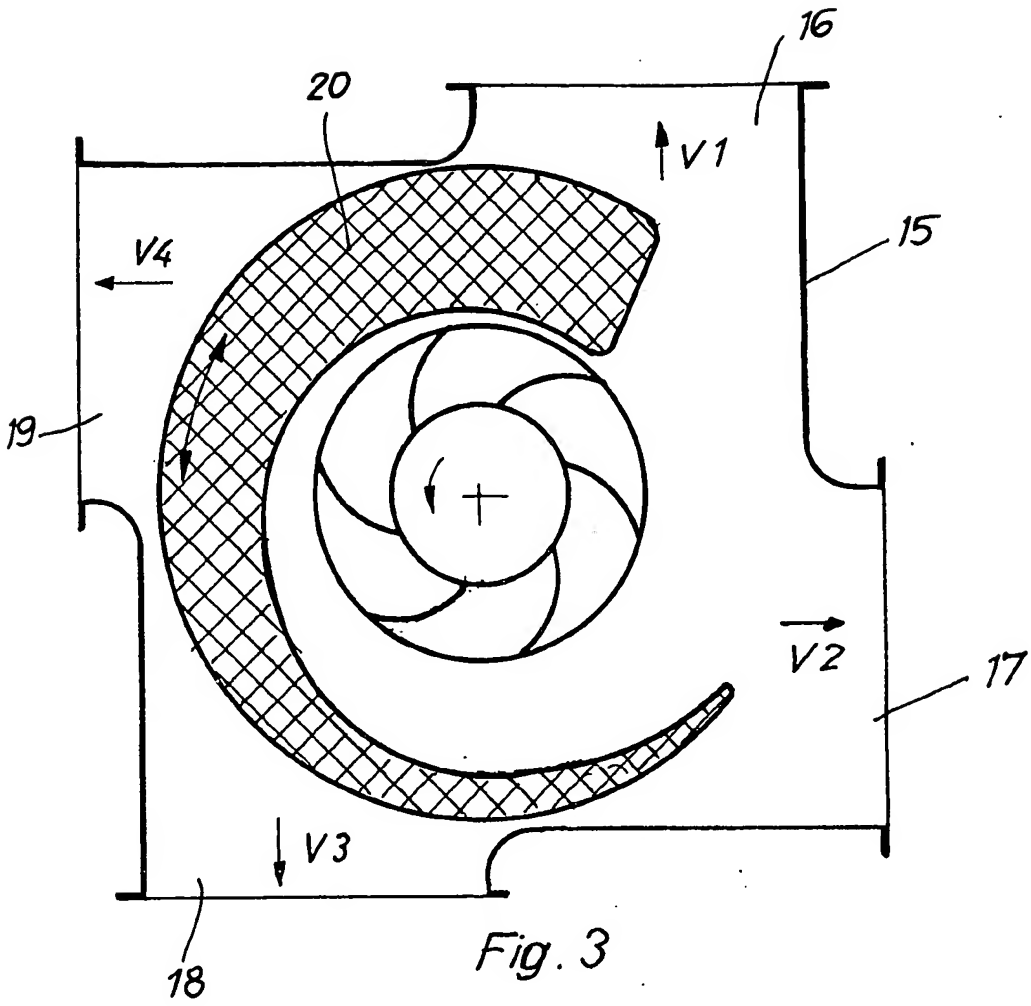


Fig. 3

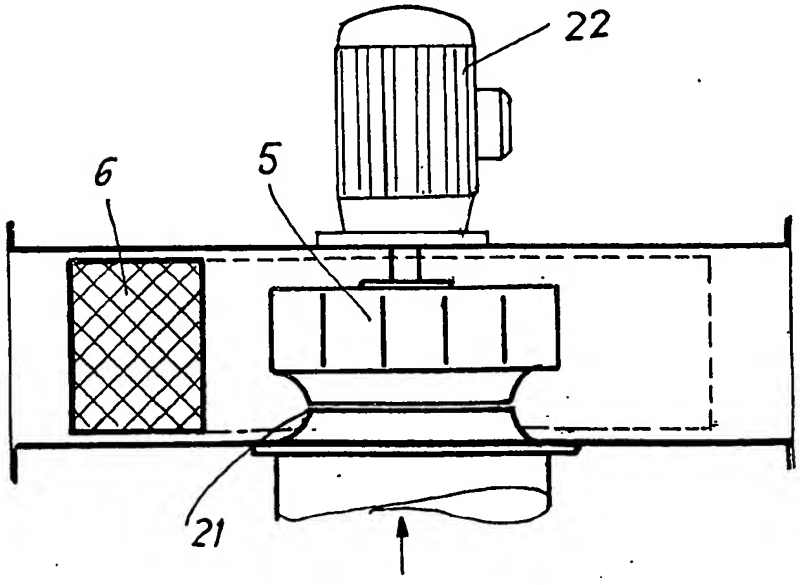


Fig. 4

SPECIFICATION
**A blower unit**

The present invention is with respect to a blower unit that may be used, for example, with air conditioning systems, and more specially to a blower unit having an outer casing, an intake port forming part of an intake duct, and at least two output ports joining up with output ducts, the blower having a motor-powered impeller and adjustment means able to be moved between two different positions for changing the distribution of an output flow from the said blower between the two or more output ports.

Systems designed on these lines have been put forward in the prior art, of which the German patent 3,002,210 may taken as an example, with the purpose of cutting down the costs of installation and the amount of driving energy needed as far as possible, more specially in the case of heating and air conditioning plant and systems of the same sort.

In known units of the sort in question it is necessary for the blower impeller to be moved in relation to the housing in an axial direction before the distribution of the flow may be changed as desired between the outlet ports of the unit and for this to be done complex sliding mechanisms for the blower impeller are needed. And furthermore in such known designs every change in the adjustment of the blower impeller gives a different, changed ratio between the breadth of the impeller and the breadth of the housing, this in turn not being without an effect on the power characteristic inasfar as great changes therein are then likely. A further point is that the known system is limited to radial impellers with the intake on one side thereof and with backwardly curved blades, and the known design may not be used in the case of radial fans with intakes on two sides and drum impellers because of the aerodynamic properties thereof; that is to say, in such cases a fixed form of housing that is not adjusted is needed, if good aerodynamic properties are to be produced.

The general purpose of the present invention is to take care of these shortcomings of known designs.

In a more limited sense, it may be said that the purpose of the present invention is that of designing blower units of the sort noted in such a way that, while keeping the useful effects of known forms of such systems, they are simpler to make and are simpler in structure.

A further purpose or object of the present invention is that of so designing a blower unit that its function is made better and its efficiency characteristic is more straightforward or regular.

A still further purpose of the invention is that of designing such a unit so that its operation becomes simpler.

Lastly one further object of the invention may be said to be that of producing such a blower unit that has a larger range of different uses.

For effecting these and further purposes that will become clear on reading further parts of the present specification, a blower unit comprising an outer housing with an intake port for joining with an intake duct and with at least two outlet ports for joining with delivery ducts, an impeller supported in said housing so that it may be turned, and an adjustment means for changing the distribution of air output between the two said outlet ports, is characterized in that the said adjustment means is made up of an inner housing having an outer limit in keeping with an inner limit of the outer housing, said inner housing being able to be moved between a number of settings, equal to the number of said outlet ports, in which in each case one of the outlet ports is uncovered and the at least one other outlet port is shut off from the blower impeller, said inner housing furthermore being able to be moved into a given number of inbetween settings. In this respect the system is best so designed that the blower impeller and the inner housing together have a function like that of a radial blower, it furthermore being best for the inner outline of the inner housing to be in keeping with the form of a spiral housing for radial blower impellers, whereas on the other hand it is best for the outer outline of the inner housing to be in keeping with the form of part of circle. In this respect the inner housing is preferably made so that it may be turned, for example about the axis of the outer housing or of the impeller. It is furthermore useful in this respect if the outer face of the inner housing and the inner face of the outer housing are placed right up rightly against each other, at least at those points where the output or pressure ports are placed, this being for the purpose of stopping leaks. In this respect it is best for known contacting or contactless seals or glands to be used. The blower impeller may for example be in the form of a radial impeller with backwardly curved blades, but however it may almost equally well be designed in the form of a many-bladed drum impeller.

Looked at generally it will be seen that the unit of the present invention is simple in structure and may be more simply and cheaply produced. Furthermore there are specially useful effects in connection with the function of the new unit. On using the blower unit of the present invention, that has a wider range of uses that known units, regular and clear flow conditions come into being. The design takes up little space and it becomes possible to make use of sound-absorbing padding therein. The overall length is shorter because complex unions, as may be needed with certain known designs, may be done without, and there is a further useful effect inasfar as the direction of flow of the two air currents may be more freely selected. On the other hand even with these new effects, it is still possible to keep the useful design points of the known systems, namely that more specially in connection with heating and air conditioning systems for large buildings the costs of putting in the system and the costs of driving power for running the plant are decreased.

The invention furthermore has to do with an air

conditioning plant using the new blower unit, the plant being characterized in that it has two blower units and that on the input sides of these blower units there is an air conditioning unit, as for example one without a fan, the output of the air conditioning being joined up with the intake port or connection of the first unit of the two blower units, the air conditioning unit having two intakes, of which the one is joined up with one of the outlet unions of the first blower unit whereas the other is joined up with the outside air, the room that is to be air conditioned being placed downstream from the two blower units; furthermore one of the outlets of the second blower unit is joined up with the free outside air and its intake is joined up with the room that is to be air conditioned and the other outlets of the two blower units are as well joined up with the room to be air conditioned. In this respect it is for example possible for the two blower units to be in the form of a twin fan, although however the fans of the two blower units may be powered separately for example. The air conditioner of the present invention is characterized by its simple and troublefree structure and by being able to be run economically. Furthermore it takes up only a little space and it's specially short in length.

In the accompanying figures the reader will see some working examples of the present invention.

Figure 1 is a diagrammatic section and side view of a first working example of a blower unit in keeping with the invention.

Figure 2 is a somewhat changed form of the unit of figure 1 looking in the same direction.

Figure 3 is a side view and section of a further working example of the invention, again viewed diagrammatically.

Figure 4 is a plane view of the unit to be seen in figure 1.

Figure 5 is a diagrammatic view of an air conditioning plane having blower units as in figure 1, 2 or 3.

Turning now to the figures and more specially to figure 1 it will be seen that the blower unit to be seen here has an outer housing 1 with an intake connection or port 2 forming part of an intake duct and two outlet connections 3 and 4 or ports running into output ducts. In this outer housing 1 there is a motor-powered blower impeller 5. The outer housing has an adjustment means of which a more detailed account will be given and with whose help the air flow coming out of the blower impeller may be distributed at will between the outlet ports 3 and 4.

This adjustment means is made up of an inner housing 6, that is placed between the outer housing 1 and the blower impeller 5. It will be seen that the outer limit 6a or contour of the inner housing 6 is at least in part in keeping with the inner limit or outline of the outer housing, as has been marked at 7a and 7b. In keeping with the invention this said inner housing 6 is able to be moved for adjustment between a number of different positions or settings in which it may be locked, the number of such positions of adjustment being the same as the number of outlet ports and the system is so designed in this respect that in each of the settings one of the outlet ports is uncovered and the other outlet ports are shut off from the blower impeller by the inner housing. Furthermore inbetween settings are possible as may be desired, in which only a part of the one or the other outlet port or (in the case of there being only two outlet ports) either of the outlet ports is uncovered. It will be seen that it is a question of a blower unit with an adjustable double-walled housing having a circular outer casing (as marked by outline 6a), in the case of which the two parts $V_1$ and $V_2$ of the flow have opposite directions of motion at the outlet ports 8 and 9. The inner housing may be so adjusted that the flow moved by the impeller is distributed between the two outlet ports 8 and 9, that is to say so that $V_1 + V_2 = 100\%$ and $V_1$ and $V_2$ may be changed to any different values desired between 0 and 100%.

It will be clear that used with the inner housing the blower impeller has the function of a radial blower, the inner outline 6b of contour of the inner housing being in keeping with the form of a spiral housing for the impeller of a radial blower. As noted earlier herein, the outer outline of the inner housing has the form of a circular arc. This being the case, it will be seen that generally speaking the inner housing has in cross section in the form of a crescent or sickle with a thickness decreasing from one end 6c to the other end 6d.

It will furthermore be clear from the figure that the outer housing has parts 7a and 7b of which each has an outline in the form of a circular arc, the common radius of all the arcs being generally the same as the radius of the outer limit of the inner housing, or in other words the parts 7a and 7b have the same radius and the radius of the outer outline of the inner housing is generally the same as this radius, steps only having to be taken to make it possible for the inner housing, whose outer limit is in the form of a circular arc making an angle of about 180° about the center of the housing, to be turned about the axis 10 of the outer housing and of the blower impeller as marked by arrow 11. The inner housing may be in the form of a hollow body that for example in the form of the invention in keeping with figure 1, is filled with acoustically absorbing material; however, for its part, the inner housing might be made of foam plastic material. Furthermore it would be best to make some attempt at so designing the inner wall at least so that it would let sound through, for example by having perforations in at least part of it or making it of perforated sheet. For stopping leakage losses as far as possible the outer face of the inner housing and inner face of the outer housing are placed right up against each other, at least at the positions where the outlet ports are placed, such sealing effect being best produced by having known contacting or contact-free seal or gland designs.

While in the case of the form of the invention of

figure 1 the outer housing has two outlet or pressure ports, that, as is marked at 3 and 4 and in the other case at 8 and 9, are parallel to each other while pointing in opposite directions, in the form of the invention of figure 2 the outer housing has two outlet ports 12 and 13 running parallel to each other and pointing in the same direction. The two parts $V_1$ and $V_2$ of the flow then have the same direction and are parallel to each other. In other respects the form of the invention of figure 2 is generally like that of figure 1, with the difference however that the inner housing 14 is designed running along a circular arc making a greater angle about the center than in the system of figure 1.

The outer housing may for example have two outlet ports placed at an angle of 90° to each other, although there is no view of this given herein.

In the unit to be seen in figure 3 the outer housing 15 has four outlet ports 16, 17, 18, and 19 for four parts $V_1$, $V_2$, $V_3$, and $V_4$ of the output flow, these ports being generally equally spaced round in a circle with angle of for example 90° between them. In this case the outlet ports 16, 17, 18 and 19 are generally placed along an arc, whose radius is generally the same as the outer limit of the inner housing 20, whose outer limit is representative of a circular arc making an angle of about 270° at the center. In the case of this form of the invention of figure 3, having an outer housing with four outlet ports, the inner housing is so designed that at the most only two outlet ports, that are next to each other, may be open and have a flow moving therethrough, as for example the flow parts $V_1$ and $V_2$, the parts $V_2$ and $V_3$, the parts $V_3$ and $V_3$ and the flow parts $V_4$ and $V_1$. This being the case, adjustment of the inner housing through 270° has to be possible.

Figure 4 is a plan view of the unit of figure 2 in section so that the reader may see the impeller 5 with its intake nozzle. It may be seen from this that the inlet duct joining up with intake nozzle 21 is axial in relation to the impeller so that the flow comes out of the impeller radially as in the case of radial blower in order to then make its way through the inner housing 6, that is in the form of a spiral housing. The driving motor is numbered 22.

As in the working examples to be seen in the figures, the blower impeller may have backwardly curved blades, although it is furthermore possible for it to be designed as a drum rotor with number of blades, that is to say in the form of a multi-bladed rotor. The impeller may be in the form of a fan impeller with air intake on one or both of its sides. However many other possible forms may be produced as for example designs with a two-tiered rotor or a design in which the motor has two output shaft ends so that two such new adjustable blower units may be driven thereby. Furthermore the inner housing may be adjusted by known actuator systems, the selection of the system used being dependent on the conditions of a given case.

In figure 5 the reader will see an air conditioning plant using blower units in keeping with the invention. In this case there are two blower units, that are marked diagrammatically at 25 in the figure and have their intakes joined up with an air conditioning unit 27, that for example is a fanless plant and whose outlet 28 is joined up with the intake port 29 of the first of the two blower units. The direction of flow is marked 26. The air conditioning unit has two intakes 30 and 31, of which one is joined up with one of the outlet unions 32 of the first blower unit and the outer is joined up with the outside air. The room 34 that is to be air conditioned is placed downstream from the two blower units, and one of the outlet ports of the second blower unit, the outlet port 35, is joined up with the outside air and the intake of this second blower unit 36 is joined up with the air conditioned room. The other outlet ports 37 and 38 of the two blower units are as well joined up with the air conditioned room. The two blower units may be designed in the form of a twin fan, but however it is still possible for the two blower units to be driven separately.

CLAIMS

1. A blower unit comprising an outer housing with an intake port for joining with an intake duct and with at least two outlet ports for joining with delivery ducts, an impeller rotatably supported in said housing, and adjustment means for changing the distribution of air output between the two outlet ports, the adjustment means comprising an inner housing having an outer surface substantially complementary in configuration with an inner surface of the outer housing, the inner housing being movable between a plurality of first settings, equal to the number of the outlet ports, in each of which first settings one of the outlet ports is uncovered and the or each other outlet port is shut off from the impeller, the inner housing further being movable into a plurality of intermediate settings.

2. A blower unit as claimed in claim 1, wherein said inner housing is designed for functioning with said blower impeller as a radial-type blower.

3. A blower unit as claimed in claim 2, wherein said inner housing has an inner limit representative of the form of a spiral housing for a radial impeller blower.

4. A blower unit as claimed in claim 2 or claim 3, wherein said inner housing has an inner limit in the form of a circular arc.

5. A blower unit as claimed in any one of claims 2 to 4, wherein said inner housing has the form of a crescent with a thickness decreasing from one end thereof to the other end.

6. A blower unit as claimed in any one of claims 1 to 5, wherein said outer housing has parts each with the outline of a circular arc, and the common radius of all such arcs is generally equal to the radius of an outer limit of the inner housing.

7. A blower unit as claimed in any one of claims 1 to 5 wherein said outlet ports of said outer housing are generally positioned on a circular arc with a radius is generally equal to the outer limit of said inner housing.

8. A blower unit as claimed in any one of claims 4 to 7 wherein the inner housing has an outer limit in the form of a circular arc making an angle of roughly 180° about a center of said blower unit.

9. A blower unit as claimed in any one of claims 4 to 7 wherein said inner housing has an outer limit in the form of a circular arc making an angle of roughly 270° about a center of said blower unit.

10. A blower unit as claimed in any one of claims 4 to 9 wherein said inner housing may be turned about an axis of the outer housing and of the impeller.

11. A blower unit as claimed in any one of claims 1 to 10 wherein said inner housing is in the form of a hollow body.

12. A blower unit as claimed in any one of claims 1 to 11 wherein said inner body is in the form of a casing filled with sound absorbing material.

13. A blower unit as claimed in any one of claims 1 to 12 wherein said casing forming said inner body has inner and outer walls and at least said inner wall has perforations.

14. A blower unit as claimed in any one of claims 1 to 14 wherein said inner housing is made of synthetic resin foam.

15. A blower unit as claimed in any one of claims 1 to 14 wherein at least at positions where said outlet ports are placed an outer face of said inner housing and an inner face of said outer housing are placed sealingly against each other.

16. A blower unit as claimed in claim 15 having contacting seals at said positions.

17. A blower unit as claimed in claim 15 having contact-free seals at said positions.

18. A blower unit as claimed in any one of claims 1 to 15 wherein said outer housing has two outlet ports therein running in parallel but in opposite directions.

19. A blower unit as claimed in any one of claims 1 to 15 wherein said outer housing has two outlet ports running parallel to each other in the same direction.

20. A blower unit as claimed in any one of claims 1 to 15 wherein said outer housing has two outlet ports placed at an angle of 90° to each other about a center of said blower unit.

21. A blower unit as claimed in any one of claims 1 to 15 wherein said outer housing has generally four outlet ports that are placed generally equally spaced in circle with an angle of roughly 90° therebetween.

22. A blower unit as claimed in any one of claims 1 to 21 wherein said impeller is in the form of a radial impeller with backwardly sloping blades.

23. A blower unit as claimed in any one of claims 1 to 22 wherein said blower impeller is in the form of a multi-bladed drum impeller.

24. A blower unit as claimed in any one of claims 1 to 23 wherein said blower impeller is in the form of a fan impeller designed for air intake on one side thereof.

25. A blower unit as claimed in claim 1 wherein said blower impeller is in the form of a fan impeller designed for air intake on two sides thereof.

26. A blower unit as claimed in any one of claims 1 to 25 in the form of a radial blower having blades thereof placed in two tiers.

27. A blower system having two blower units as claimed in any one of claims 1 to 26 and a drive motor with driving shafts at two ends thereof, the impellers of said blower units being keyed on said shafts.

28. A blower unit as claimed in any one of claims 1 to 26 comprising at least one actuator for changing the positions of said inner housing.

29. An air conditioning plant comprising two blower units as claimed in any one of claims 1 to 26, an air conditioning unit joined with intake ports of said blower units, said conditioning unit having an outlet port joined with a first one of said two blower units and having two inlet ports, the one of these inlet ports of said conditioning unit being joined with one of the outlet ports of said first blower unit and the other of such inlet ports being joined up with the outside atmosphere, a room to be air conditioned being joined up with outlets of the said blower units, one of the outlet ports of the second blower unit being joined with the outside atmosphere whereas the intake port thereof is joined up with the said room and the other outlets of the two blower units are joined up with said room as well.

30. An air conditioning plant as claimed in claim 29, wherein the said two blower units are in the form of a twin fan.

31. An air conditioning plant as claimed in claim 29, comprising means for separately driving the two said blower impellers.

32. An air conditioning plant as claimed in claim 29, wherein said conditioning unit is a fanless air conditioning unit.

33. A blower unit substantially as hereinbefore described with reference to figures 1 and 4 of the accompanying drawings.

34. A blower unit substantially as hereinbefore described with reference to figure 2 of the accompanying drawings.

35. A blower unit substantially as hereinbefore described with reference to figure 3 of the accompanying drawings.

36. An air conditioning plant substantially as hereinbefore described with reference to the accompanying drawings.

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US-CL-CURRENT: 429/220, 429/221 , 429/222

ABSTRACT:

CHG DATE=19990617 STATUS=O> The blower has an outer housing (1) with an intake port (2) for connection with an intake duct, and at least two outlet ports (3 and 4) for connection with outlet ducts. The flow of air from the impeller (5) to the two or more outlet ports is controlled by an adjustable wall so that the distribution of the flow between the two ports is changed. The adjustable wall is in the form of an inner wall (6) placed between the impeller and the outer housing and having an outline conforming with that of the outer housing. The adjustable inner wall may be moved into a number of different settings corresponding to the number of outlet ports, in each of which one of the outlet ports is uncovered and the other outlet port or ports are shut off from the impeller by the inner wall. Furthermore the inner wall may be moved into any number of positions between the settings. The wall (6) may be filled with acoustically absorbing material or made of foam plastics. <IMAGE>